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TITLE:	The Development of European Waterways, Road and Rail Infrastructures: A Geographical Information System for the History of European Integration (1825-2005)
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Abstract:

This project documents and assesses the contribution of new transport technologies and infrastructures to the process of European integration from 1825 to 2005. The results of the CRP will provide an empirical basis for multidisciplinary studies on the relationship between terrestrial infrastructures and the European integration.

We develop a comprehensive historical pan-European digital geographical information system (GIS) comprising the inland waterways, road and rail networks of Europe. The area covered by the project is all of Europe except the former USSR plus the Baltic states and former Yugoslavia. This coverage is dictated by limitations in data availability.

Introduction

The construction of a rail and road network was a fundamental component of the process of integration by linking the diverse regional societies and economies of Europe. First trains and subsequently motor vehicles increased the speed and decreased the cost of moving people and goods. Trains by making freight transport more efficient enlarged markets and thus changed the market strategy of companies. By making passenger transport faster and cheaper they expanded both national and international travel, which contributed to broadening the social and cultural horizons of an ever wider section of the population. European integration has been considered from various points of view: the institutional consolidation since World War II; the framing of identities in contemporary Europe; and the long run process of so called "hidden integration of Europe" (History and Technology –H.T.-, 2005).

The main goal of this proposal is to create new integrated pan-European digital datasets and to analyse these resources to underpin a narrative of the role of transport in long-run European integration. The new datasets will consist in a unified GIS of Europe's developing transport infrastructure together with other social, economic and demographic variables. This GIS will contribute to this third perspective by creating a new empirical basis for the analysis of long-run European integration. This can only be achieved by spatially integrating datasets of economic, social and demographic variables with transport infrastructure datasets.

At the moment there are many research groups working on GIS and transport history in several European countries. To analyse the contribution of transport developments to European integration it will be necessary to unify these fragmented research projects and to fill in any gaps in coverage. This proposal brings together all seven internationally oriented research groups currently applying GIS to the history of transport in Europe.

State of the art in the history of technology and European integration

European integration has been analysed mainly from a political and cultural point of view. A survey of the Journal of European Integration History indicates that European integration is generally conceived of as a political process of international relations among nation states. From that point of view, the Treaty of Rome (1957) and its precedents form the starting point. If European integration is considered from a socioeconomic point of view, then technology plays an important role. The original foundations of the modern European transport network were created by the building of the railways in the 19th century. Since then, the network has been improved, to cope with higher demand, by new roads (motorways) and more recently by high-speed trains.

Thus Europe is not just a political construction but an economic and social construction underwritten by technological change. In "European Integration. Through the lens of technology" (H.T., 2005) technology is viewed as an agent of change in an non-deterministic sense. Special attention is given to railways and the international institutions to which these give birth: "such infrastructure includes the physical coupling, regulatory and institutional structures and standardization practices needed to make coupling work" (van der Vleuten p. 9). This issue is developed by Irene Anastasiou (2004), showing how international institutions were organised as early as 1849 to set technical standards and facilitate international railroad traffic in terms both of rolling stock and legal issues.

There is a large historiographical gap to fill since the main contributions to the history of transport have focused on the national level. We will integrate this information and make it comparable. Earlier useful projects are: Merger, Carreras, Guintini; COST, 340; O' Brien).

We agree with van der Vleuten (H.T., 2005, p.39) that it “is time for the study of the European network development and its entanglement with broader societal changes” (and this requires) “more systematic research”.

Aims and objectives

European integration is not only about institutions or treaties or the formation of a European identity. We will focus on the transport infrastructures that underpinned economic and social integration. To develop our understanding of the long and hidden process of European integration we will assemble comparable datasets on the terrestrial transport systems focussing on the international rail and road networks that improved access to all of Europe. Special attention will be accorded to the intra-European sea routes that linked terrestrial transport networks (especially in the British and Scandinavian cases).

This will include the development of a GIS charting the growth of Europe’s transport infrastructure from 1825 to the present. We will concentrate our research on retreat of inland water transport, the growth and subsequent retreat of the rail network and the rise of the road system.

The second major objective of the project will be to use this GIS resource in conjunction with other datasets (of economic, social and demographic variables) we have produced to relate the building of transport infrastructures to the pace and intensity of European integration. This will provide a comprehensive view of the co-construction of the growth of the European transport network and the European community over the past two centuries.

Vision

As we said, this project will promote the study of the relationship between terrestrial infrastructures and the making of Europe. We develop a comprehensive historical pan-European GIS comprising the road and rail networks of Europe. We integrate this with other databases on Europe’s population and economy. This database will be made available to researchers, with potential users including those analysing the role of transport infrastructures in the making of Europe, or working on economic history more generally.

The diffusion plan includes a dedicated web site for the project and datasets.

The objectives of the Water, Road, and Rail project are:

1. To create a GIS of the development of Europe’s rail and road networks from 1825 to 2005. This will be done using information from a variety of scales including the pan-European, individual countries, and regional and local datasets.

2. To link this database with complementary digital demographic and socioeconomic datasets at the same scales, creating an integrated GIS product.

3. To analyse how the economies and societies of Europe have evolved over the past two centuries, conducting multi-scale analyses of the relationships between transport and socio-economic indicators, and their joint evolution over time.

4. To link transportation to population databases. This allows the calculation of population accessibility over time (Marti, Tapiador... 2005). Differences of accessibility have been a key factor in explaining the territorial imbalances in Europe. At a more detailed level, the transport network provides a guide to understanding the location of companies.

5. Special attention will be given to the linking of nations across national boundaries.

Strategy and work plan: data collection and methodology

Data collection

The process of data collection and GIS construction is based on the objective of writing an original narrative on the European integration process. The production of maps and data assembling is not an objective in itself but to provide the empirical basis for the analysis of the integration process in the long run.

We focus on Europe as a territory. Linking this huge area for the inland transportation of people and goods has been a challenge since the Roman Empire. New technology has provided the means to achieve this goal since the 19th century. A wide range of sources are available to document this process. We mention the two most relevant source types

- A long series of atlases and maps, ranging from 1825 to present. This information has been already collected for the digitisation of the railroads. The same material will be used to digitise inland waterways and roads.

- Timetables of the main train routes. Thomas Cook's timetables provide information for Europe from 1875 onwards. This allows a good overview of passenger traffic intensity and speed between the main European stations. Bartholomew's and others also provide long series of comparable materials.

Methods

From a methodological point of view, the project operates at several scales. At the highest level we will create a GIS of the development of the transport network for the whole of Europe covering the development of both the rail and major road networks from 1825 to the present. The major navigable inland waterways will be included as well to show the transition to the rail. We will also integrate timetable and fare information to allow the calculation of passenger transport speeds and costs on some of the most important rail routes (international connections and the national ones linking the major cities). A key advantage of GIS is that it enables different datasets to be integrated with their exact location. The key methodological point is to integrate the transport GIS with other GIS databases and with demographic information to provide a platform for multi-scale analysis. Most of those related GISs have already been created.

With all this material we will then perform a spatial analysis of the information stored in the GISs. This will take the form of a historical narrative of European infrastructural integration. The focus of this narrative will be on the increasing and decreasing connectedness and accessibility of different parts of Europe. The rail and road networks have been important agents of this change, which is still ongoing: new high-speed train track and motorways. They not only connected people, towns, cities and nations physically, but also made it possible for the users of these infrastructures to see themselves as part of a community, even though they never saw or spoke to each other.

The narrative will focus on the way villages, towns, cities, regions and nation-states were geographically connected and disconnected during particular periods of time. It will produce an overview of the development of the national and trans-national infrastructural landscape of Europe. We do not anticipate producing a smooth linear story of ever expanding connections. On the contrary, the Cold War, for example, led to a clear disconnection of Eastern and Western Europe and we expect this to come through in the infrastructural database. Yet, we also anticipate that there might have been more flows between Eastern and Western Europe than is often assumed in the Cold War literature. In this respect, the position of Finland is particularly interesting. This was not the only period in which European connectivity suffered. The inter-war years are also often seen as a period of contraction in which trade in particular was reduced. We will compare this picture with the outcome of our analyses.

Finally, we will produce detailed case studies of individual regions, cities, towns and villages across Europe to provide in-depth accounts of how the growth of the transport network has benefited and afflicted specific communities in different places at different times. In this way we will be able to present a comprehensive view of the co-construction of the growth of the European transport network and the European communities since the nineteenth century.

Tasks breakdown

The **Dutch** partner is collecting data that has to be completed. This includes: National railway network data for the entire period; National and international railway traffic data from World War II; National road network data from World War II; National and international road traffic data from World War I. Those data will be integrated with existing digital rail and road data provided by the Spanish partners to form the basis of the GIS.

The **Spanish** partners will integrate the geo-spatial data on the development of the transport network with a variety of other geographical resources. This will allow us to study the relationship between the development of the transport infrastructure and topics such as population change, economic growth and political development. This will include the development of new analytical tools for the study of spatio-temporal change. Special emphasis will be put on the socioeconomic impact of the high-speed train and its current and future importance on European integration.

The GIS database will be used to construct a series of thematic maps. This work is done by both the **Spanish** and **Dutch** partners in connection with the **Associated German** partner, Dr. Kunz, using the Mainz-based mapserver “IEG-Maps” as well as the national historical GIS “HGIS Germany” and the European GIS server of the Spanish team. The German partner will construct series and sub-series of thematic maps relevant to the integration of European infrastructures over time. If possible, these maps will be made interactive (i.e.,"clickable") so that users can query the data using a standardized interface. Data will be provided by the Dutch partner. Graphs and other outputs produced from the statistical database will also be integrated into this platform. See http://www.ieg-maps.uni-mainz.de. The German partner will also continue with a GIS project that includes transport developments in central Europe. See http://www.hgis-germany.de.

The **British** Associate Partner, Dr Gregory, together with the **Spanish** team, will create a more detailed GIS of the growth of the railways in England & Wales using larger-scale maps and atlas sources. This will be linked to the Great Britain Historical GIS (GBHGIS) a detailed GIS that contains British census and related data. This will provide a resource that will allow a much more in-depth view of the impact of the growth of the railways in Britain. This will be analyzed with the assistance of Dr. Leigh Shaw-Taylor (University of Cambridge) and Professor Robert Schwartz (Mount Holyoke College, USA).

The **Finnish** partners concentrate on collecting statistical data on Central and Eastern Europe and the USSR. This difficult but important part of the project will fill many gaps in previous attempts to map the terrestrial infrastructures of Europe, and will provide a full pan-European dimension to the project.

The **Portuguese** partners gather statistical data on population for the 20th century in order to complete existing databases. Special attention will be given to the analysis of the impact of transport infrastructure on the Iberian Peninsula with the cooperation of the Spanish colleagues. The output of the project will be integrated into their existing *Atlas* website: http://www.fcsh.unl.pt/atlas.

The **Turkish** partners research the role of transport as a means of integration and regional cohesion. It will also use socio-economic indicators to focus on the impact of

the growth of the transport network on people and businesses. Finally they will explore the cultural responses to the increasing connectedness of Europe.

The **French** partners construct a Geographic Information System database with data on the expanding rail system and population change during the studied period. The principal challenge will be assembling spatially referenced data over the "longue durée" and then providing linkages with the other components of the European GIS. Then, spatial analysis method will yield new understandings of the interaction between railway expansion, uneven economic development, and demographic change.

The approach of the **Bulgarian** partner is pronouncedly interdisciplinary, combining the tools of economic history, political history and international relations. The idea is to conceptualise the reasons why the three concentric circles of Balkan infrastructure - regional, national and all European - have not been complementary. This part of the project will take advantage of the GIS and data collected by the participants in the main project, check their basic findings against the complicated interplay of national, regional, and continental factors in one specific and important part of Europe

Individual projects

Individual project 1 SPAIN

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A GIS for the History of European Integration (1825-2005): The European Road and Rail Infrastructure

Aims and objectives

The two **Spanish** partners will integrate the geographical data on the development of the transport network with a variety of geographical resources to ease and assist historical interpretation. This will allow the Spanish team to study the relationships between the development of the transport infrastructure and topics such as population change, economic growth and political making. This will be then make available to the rest of the components of the European network.

Professor Marti-Henneberg (UdL) coordinates the GIS database creation and cartography areas, while Dr. Tapiador (UCLM) coordinates the implementation of the spatial analysis tools. Both will take in hand the interpretation in terms of historical narratives.

The objectives of the individual project are:

1. Provide a main database infrastructure for the use of scholars and teaching
2. Our research group will use this information to analyse the importance of transport availability in population distribution and urban formation.
3. This main subject will be studied from the point of view of a better understanding of the integration process in Europe in real terms. That means, for example, considering socioeconomic data to measure the real links among countries, rather than use a political point of view.

Regional contrasts of development on the long term will arise from this analysis. This issue will provide new information for the study of the territorial imbalances in Europe.

Methodologies/experiments

1. Development, design and setup of the European railways GIS (1825-2005) which will include EU countries, Switzerland and Norway.[1]

2. Enhancement of the GIS with the inclusion of data from Central European countries (Romania, Bulgaria, Albania and former Yugoslavia).

3. Expansion of the GIS to include the major European roads and motorways from 1825 at ten years interval sampling (1830 onwards).

4. Creation of a database of the urban development in Europe, including all the agglomerations of more than 10.000 inhabitants. This information will be georreferenced to allow accessibility calculations for every historical period, and will also be included into the GIS. All railways will be included and classified: narrow gauge, standard gauge and new High Speed lines.

5: The inclusion of roads and motorways in the GIS will be based roughly in the same atlas sources and follow the same digitalization process.

6: Adding information on population distribution is a novelty from the previous proposal. Data sources are the official censuses, which provide information at the municipal level.

Work plan

We develop new analytical tools for the study of spatio-temporal changes. Special emphasis will be put on the socioeconomic impact of the high-speed train and its future importance on European integration [2].

In the interpretative stage that will follow, [3] we will analyse how geographical information affect the narratives of the European integration. Coordination with other partners will then be essential, but it is assured by the work breakdown and how the tasks interweave. As a part of the coordination efforts in the preparation of this proposal, special care has been put in designing a synchronized work flow to ensure the coherence of the overall work.

While the technical part is very important to gather and organize information, the interpretative stage is the core of the project. We tackle the issues associated with the *data model* definition: a *data model* is an abstract representation of the data used by the project, such that a meaningful interpretation of the data can be made. It is deemed that different choices of this data model generates different geographical spaces, each one associated with a subjective interpretation of reality (Tapiador et al. 1998) and thus with the historical developments that geographies may map. In our case, we analyse how different infrastructure data models may affect the analysis of the European integration.

Another task will be to analyse how the informational content of the database embodies an a priori interpretation of evolution, that is, we will study the effects of the prior geographical choice into the historical interpretation (Tapiador 2004). Here, we work together with the Turkish and Dutch partners to develop a heuristic model for the European rail and road networks. We study the selections due to scale and spatial resolution using several case studies, analysing the potential consequences of coarse-grain choices (Tapiador and Casanova 2000). The effect of circumvent mapping small or apparently residual data will be considered: as an example, we

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[1] This phase will be completed in 2007, as a result of the current project of the Ministry of Education in UdL (2004-2007). See information about sources and selected cartographic results in: http://web.udl.es/dept/geosoc/europa/index.html (Transportes).

study the role of quarry and mining infrastructures and private lines in the mental conceptualization of the geographical space in which history develops.

We also ask how analytical tools (do not) reflect historical interpretation(s). The danger of a-historically applying today's analytical tools to the past must always be considered when dealing with buffering and topological relationships, since it can easily yield to conceptual and logical misinterpretations (Tapiador 2004a). Besides, it is not clear at the moment that the same Euclidean tools can be applied to dissimilar periods and countries (Tapiador 2004b). It is well known that cultural and subjective spaces influence distance, and thus analytical tools should reflect this fact. We analyze whether this issue is relevant in our case. On the other hand, the difference between what we know and what they (the people and the decision makers in the past) knew in terms of the actual span of the European infrastructures in the past can be proved to be essential to a meaningful interpretation, as we will illustrate for our case. The radical differences between our perception and analysis capabilities when using historical information must be contrasted with the past data availability and geopolitical framework in which the making developed. The role of fragmentary or partial knowledge will also be considered for the analysis to reflect the decision making processes.

Scale and projection effects will also be analysed. The likely effects of conformal mapping in the interpretation (Tapiador and Marti-Henneberg, to appear) will be studied, and conclusion will be applied to the infrastructure making process. In relation with this, it is important to ascertain how the Cartesian view that geographical information embodies affect narratives and interpretation of the making of Europe. Since it is likely that our results in this task will be applicable not only to infrastructures but to other historical aspects of the making of Europe, we will further explore this line of research.

Individual project 2 TURKEY

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Aims and objectives

The principle aim of the Turkish individual project is to investigate the relationship between transportation systems (railways, highways, waterways) and developments in social and economic indicators in Europe. The task is to contribute to the integrated GIS product through 1) contributing to the creation of the integrated GIS dataset by supplying information on Turkish road and rail networks and historical social and economic indicators; 2) analyzing their joint evolution over time 3) presenting a case study focusing on Turkey.

We will primarily deal with integrating the European transport network data and socio-economic data through investigating how transport (road, rail, waterways) infrastructure have influenced and will influence the society in Europe. The shaping of modern societies through road and rail infrastructure has been explored with particular emphasis on concurrent interactions across socio-economic development and innovations in transport networks (van der Vleuten, 2003 and 2004). The socio-economic changes and transport infrastructure involve a simultaneous interaction. Causality between them is a complex phenomenon.

The literature suggests that such complex cause and effect relationship has been investigated through various perspectives. The socio-technical perspective suggests that society shapes technological changes (Pinch and Bijker, 1984). Sociotechnical system encompasses both social and technical components that are linked in an organic way. A change in one of the components affects the other. Sociological

conflict perspective stresses the conflict dimension of technological progress and thus argues that technological change rearranges social relationships (Hard, 1993). The third perspective asks how society and network technologies have historically *co-evolved* by relating the rise of network societies to the rise of information and communication technologies. The infrastructural technologies constitute an intermediary layer linking society across borders (Castells, 2000; Van der Vleuten, 2004). European "border integration" has been analyzed as an emergent outcome of a process of linking and de-linking of infrastructures, as well as circulation and appropriations of systems and knowledge (Misa and Schot, 2005).

The conceptual perspective adopted in this project is that *society and technological infrastructure have co-evolved over time* and that there is a concurrent interaction between network society (roads, railways, pipelines, digital networks, etc) and social structure. The hypothesis is that there exists a *simultaneous interaction* between transport network and socio-economic developments in European integration/fragmentation.

There is a vast amount of literature focusing on the connection between transportation infrastructure and economic development and social/economic indicators (e.g., Gaulthier, 1970; Jones and Rosenberg, 1992; Latella, et.al., 1998; Ramirez, 1999). In addition to descriptive studies, econometric models have been formed in an effort to explore the relationship between economic development and changes in transportation infrastructure. The econometric studies confirm a positive relationship between transportation variables (historical transportation data) and developments in social and economic indicators thus validating the suggestion that transportation is an important factor of production in making economic development happen (Forkenbrock, 2002).

This study aims to contribute to the existing literature on the relationship on economic development/ transportation infrastructure by:

1. Using an expanded data set (1825 through 2005).
2. Focusing on the *bilateral* relationship between transportation infrastructure and economic development thus testing the hypothesis developed in the conceptual model (Figure 1).
3. Using a vector autoregression (VAR) model, perform a cross-section (across Europe) and time series (1825-2005) analysis to explore the joint evolution of the integrated European databases that are specified in the CRP.

Transport Database creation

The first contribution of the Turkish partner to the project is to create a historical database for Turkey's transport network from the following data sources:

a) Office of Prime Minister

b) State Planning Organization

c) State Railway Administration

d) State Highway Administration

e) Ottoman archives in İstanbul, Ankara, Bursa and İzmir

f) Related chambers of commerce and chambers of industry

g) Related archives of the municipality organizations

Transportation infrastructure and social and economic indicators

The second contribution of the Turkish partner is to develop a model to explore the relationship between transport network and social and economic indicators. At this

point, a socio-economic historical dataset (1825-2010) will be developed through contributions from the project partners. With close collaboration with the Dutch partners (UCLM), the project seeks to interpret the informational content of the GIS database in transport network and social and economic indicators such as production, consumption, trade, income, education, population, distribution and clustering of industries across Europe.

Similarities and/or disparities across socio-economic indicators and transport network within Europe during the 1825-2010 will be investigated. The proposed method is to develop and estimate a time series VAR (Vector Auto Regression) model and interpret the simultaneous and two-way interaction of transport networks and social and economic development patterns. The model will seek to explore the relationship between development indicators for the European regions and changes in transport network.

Case study: Reciprocal relationship between transportation and dispersion of economic activities

The third contribution of the Turkish partner is to present a case study that focuses on İzmir – the third largest city in Turkey - and its vicinity (including neighboring provinces, Manisa and Aydın) where the first railway in Turkey was constructed between İzmir and Aydin in 1856[2]. The aim here is to demonstrate and analyze the interactions between the transportation network, economic activity and socio-cultural changes. In doing so, **the first part of the case study** will demonstrate the dispersion and changes in economic activity and its relation to advancements in transport infrastructure. The major issue here is to understand how industrial location decisions in İzmir and its vicinity have evolved through observing spatial distribution of economic activity and transportation infrastructure.

Following the argument that infrastructural changes creates a new era in sociological tradition, **the second part of the case study** will explore changes in life-styles, artifacts and values of the individuals. The purpose here is to see to what extent, technological, economic and socio-cultural changes have followed similar/dissimilar patterns and whether such patterns are parallel to the Western lifestyles, artifacts and values within the time period of 1856-2010. Based mainly on archival records, the project aims to contribute to the study of the relationship between the development of the transport infrastructure and topics such as population change, economic growth and political making in the Ottoman Empire and Europe.

Individual project 3 FINLAND

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The European Road and Rail Infrastructure: A Geographical Information System for the History of the European Integration (1825–2005):

Finnish Railways in the Nordic and Russian context (FiRa)

From a transportational point of view, the geographical position of Finland differs greatly from that of most Central and Eastern European countries. This refers to both transnational communication and national-level transportation networks, that cover a wide geographic area with a relatively small amount of population.

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[2] Otoman railway construction began in the wake of the Crimean war and the subsequent Treaty of Paris under which Otoman Turkey was recognized as part of Europe.

Finland shares border with three other countries: Sweden, Norway and Russia. Most of the Finnish railways were constructed between the period of 1862 to 1909. Already in 1870, the Finnish railway network was connected to the Russian network.

The railway network has been considered to had a strong impact on the spatial distribution of population in Finland. This is due to the fact that Finland was urbanized mostly after the railway network was already established. According to Alestalo (1983), the concentration of Finnish population began in the latter half of the 19th century and accelarated after the Second World War. This process was strongly related to the construction and development of transportation networks.

Theoretical background

The theoretical background of the study is based on the concept of innovation diffusion and the centre-periphrery theory. The study also makes heavy use of theories based on applications and analyses of Geographical Information Systems and Science (for example Davis 2001, Longley et al. 2005, Verbyla 2002).

Using theories mentioned above we aim to investigate whether, and to what extent, the railway network has contributed to the spread of new ideas, innovations and development to new areas connected to Southern Finland, that is regarded as the main source of innovation at the national level. We aim to approach this issue by analyzing the history books of some of the main municipalities along the railway network.

The centre-periphery structure has a pertinent role in the Finnish geographic context, and accordingly it has traditionally been included in various regional analyses. Furthermore, also the other transport infrastructures, like roads, waterways and channels will be included in the analyses as relevant and applicable.

Data and methods

Finland has produced statistical population data in censuses since the 1880's, mainly at municipality level until the 1980's. The number of municipalities has decreased from over 600 to the current number of about 430 municipalities. After that, changes in the distribution of population in Finland over the period 1970–2000 have been examined in terms of a coordinate system of 1 x 1 km grid cells. This kind of georeferenced data, which is based on the use of about 30 registers every year, is quite unique in the EU, and globally too. By utilizing this data source we will try to find out more exactly the spatial impact of the railway network on the population structure compared to the use of municipality level data. We try to arouse new concepts of the use of railways during the last three decades.

Some Finnish historical Atlases will also be used to acquire information about the development of the railway network. The first Finnish Atlas was published in 1899. The atlases provide a useful source of information about the transportation infrastructure. Also historical paper maps of different scales produced by National Land Survey will be digitized. These data will be extended with historical data from Sweden and Russia in order to assess the transnational communications between the countries starting in the latter half of the 19th century.

The main tool which will be used is GIS with its many analytical methods. The methods include e.g. network analysis and zonal statistics. Also historical GIS and cartography will be involved in the research

However, building and creating the database is the most crucial part of work in GIS. Using inaccurate and/or inappropriate data will lead weak and wrong conclusions. The research team already possesses knowledge on how printed historical maps may be automatically digitized and transferred into a modern GIS while minimizing the amount of error in the process

Results

The Finnish part of the work will concentrate on its national characteristics and strengths comprising mainly of the availability of population data gathered on a grid cell basis, and the long experience by the research team in analyzing Finnish regional structures. The main expected results of the Finnish study can be described as follows:

1) Railways and the change of their meaning in a long run in the context of a remote and sparsely populated country having very long transportation distances compared to countries located in the heart of the European continent. Results can partly be generalized to Sweden. Although the circumstances in the Nordic countries differ significantly from that of the rest of Europe, we believe that Finland can be used as a case study with regard to utilizing cell-based population data sources in analyzing and modelling the effect of transport networks on regional development in Europe.
2) Accessibility of railways and their change in 1880–2000 in people's everyday life using the municipality level data and the network data Finnish population was distributed quite evenly in the beginning of the research period. Nowadays the population is more and more concentrated to the south of the country and some regional centres in the middle, eastern and northern parts of the country.
3) Effect of Russian and Swedish railway networks to the development of Finnish and Nordic development of railways from 1870 onwards.
4) Finnish grid cell data and its potential in the research into the European infrastructure context. The 1x1 km data enables accurate population analyses independent of administrative units. The analyses have been carried out for all the Nordic countries already.

Individual project 4 THE NETHERLANDS

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'Crossing borders. Waterway, rail- and road connections between the Netherlands and Germany, Belgium and the UK (1825-2000)

Until now economic historians and historians of transportation have mostly focussed themselves on national infrastructures. The Dutch historiography and that of neighbouring countries are no exception to this rule. This proposal aims to collect and analyse data on the European transport networks and to study more in depth the transnational connections between the Netherlands and its neighbouring nations by waterways, rail lines and roads.

As literature shows the development of transport infrastructures was no linear process. Infrastructures did not always live up to the expectations of their initiators – as the history of the many rail lines, canal and river projects shows. The literature stresses that different modes of transport were competing with each other, but were at many occasions also complementary. The history of the Dutch – German railways design and the Rhine navigation illustrates this. As a result transport costs tended to decline. Borders were important features in the process. Infrastructures were subject to political manoeuvres and toll gathering. Taxation made border crossing time-

consuming and expensive. At many occasions infrastructures were put forward explicitly to connect regions, nations and markets at both sides of the borders, in practice the borders were stubborn. Connections once established, vanished or got replaced.

We aim to improve the understanding of the process of linking and de-linking of different transport infrastructures. To this end, we develop a statistical database on road, railroad and waterways development within the various nation-states and between the nation-states, from 1850-2005, an analytical tool to interpret this database, and the mapping of the functioning of several waterway, rail- and road connections between the Netherlands and Germany, Belgium and the United Kingdom and a few other connected European countries further away.

Methodology

The research will facilitate the construction of a database containing data on network development (e.g. length of tracks) and traffic (measured in terms of number of passengers and goods). A large amount of data will have been collected by June 2007 within the framework of the current Transnational Infrastructure research project at the University of Eindhoven. These are: national railway network data for the entire period; national and international railway traffic data for the period after World War II; national road network data for the period after World War II and national and international road traffic data for the period after World War I (source: United Nations statistics).

In this project the Dutch team will expand this data collection in co-operation with the other partners. Special emphasis will be laid on data on water-based traffic (using sources of different organisations).

This database will be used to construct a general European series of thematic maps in cooperation with the Spanish team and the associated German partner Andreas Kunz in the context of the Mainz-based map server IEG-Maps. In this cooperation series and sub-series of thematic maps with intervals of ten years are made, i.e. on themes relevant to the project. The IEG-maps will be made "clickable" and thus serve as user interface for standardized queries on the data and on thematic maps. Also graphs derived from the statistical database will be integrated into such a platform.

In cooperation with the other members of the project a toolkit will be developed to analyse the trends visible in the maps, graphs and tables constructed using the data base. It has to explain the process of linking and de-linking of countries and regions by these transport infrastructures by taking into account demographical, economical, political and cultural trends and the different modes of transport as competing and thus mutual related units.

Besides the statistical work the Dutch team will conduct case studies to bring the analysis of the gathered statistical material one step further. The heuristic of case studies is meant to be complementary to the statistical analyses in explaining the linking and de-linking of regions and countries. Where statistical analyses can highlight relations between the availability and the use of the different modes of transport, they can not illuminate the motives of the actors involved in the way historical case-studies can.

On the other hand, the designed case studies will also allow the weighing of economical and demographical factors against political and cultural influences as determining forces behind the connecting and disconnecting through transport infrastructures. Relating the outcome of the statistical work with the results of archival research on the actors in charge of these infrastructures and the customers will increase the analytical quality of the research. The cases also enable to study the rail, road and water infrastructures in their complex interwoven relationship.

The rail-, road- and waterway corridor Arnhem – Emmerich – Oberhausen

The railway line Arnhem - Emmerich, opened in 1856, was the main rail connection between the Netherlands and Germany at that time. The designers of the railway Amsterdam-Cologne advocated its construction as 'an Iron Rhine' to facilitate transportation of goods from the Amsterdam harbour to the German Rhineland and visa versa. From the first version of the plan in 1834, the scheme was contested by commercial circles in Rotterdam advocating the improvement of Rhine navigation instead. Commercial organisations in Cologne meanwhile proposed the constructing of another 'Iron Rhine' through Aachen and Liege to Antwerp (completed in 1843). Ten years later on the instigation of a circle of Aachen industrialists a competing rail line was started connecting Aachen with Maastricht, later extended to Hasselt, but aiming for Antwerp. Only thirteen years later a connection between the Arnhem and Emmerich was completed. This line had to compete with other Dutch – German railways in the decades to come, with the transport on the Rhine itself where possibilities to navigate drastically improved in the second half of the nineteenth century, and to some extent even with road connections. On the other hand, the different modes of transportation also stimulated each other.

This case study examines the actions of the actors in charge of the 'Iron Rhine', its competing railways, the Rhine as a competing transport infrastructure and their counterparts in charge of the roads and highways between both countries. The case will reconstruct the ways these actors operate their infrastructures and will map their use. Combining this reconstruction with researching the relevant economical, demographical and political factors, will enable us to analyse the success and failures of these infrastructures.

The rail-, road and waterway corridor Roosendaal – Essen - Antwerp

Traditionally Antwerp was connected to the Netherlands by the river the Schelde and an important main road constructed in the Napoleonic period. In 1852 the 'Société Anonyme des Chemins de Fer d'Anvers à Rotterdam' started a railway line from Antwerp via Roosendaal to Breda and Zevenbergen. The railway company also exploited a connecting boat to Rotterdam. Another Belgium private railway firm operated a line through Turnhout-Tilburg. The first line aimed to connect the harbours of Antwerp and Rotterdam, the second meant to link the Antwerp harbour with the port of Amsterdam. In competition with these lines the 'Maatschappij tot Exploitatie van Staatsspoorwegen' built a railway between Eindhoven – Hasselt and Liège. This manoeuvre gave the Dutch influence on Belgium soil following the Belgian influence within the Dutch borders, until an exchange ended the situation.

Finally the line Antwerp – Roosendaal – Rotterdam got the upper hand. The changing fortunes of these three lines offer us insights on how politics and economics influenced each other and shaped the operation of these infrastructures and the regions they were linking. Waterways, roads and railways were competing but also complementary modes of transport from the 1850s on, well to the present.

The increased importance of the corridor Antwerp – Roosendaal is in strong contrast with the weak connections between both sides of the border in neighbouring Dutch and Belgium parts of Brabant. In the region hardly a canal connection is functioning, and all passenger rail connections between both parts of the border are cut except for the Roosendaal link. Intriguingly the railway lines were disrupted even before the building of motorways in the region and the start of the mass-motorisation. This uneven development of infrastructure asks for an explanation and seems a good case to examine the influence of demographical, economical and political forces. The Belgian plans to revise an old railway line between Belgium and Germany through the Netherlands via Roermond and Weert blocked by the Dutch government, are

another indicator that borders are still important forces influencing infrastructure development.

Other case-studies

Road- and rail transport by ship with the UK via Vlissingen (from 1875 on) and Hoek van Holland (since 1893) and Harlingen. The ferries plying from these harbours to the UK are interesting examples of multi-modality of water, rail and road transport with contrasting fortunes. Latecomer Hoek van Holland was the most international of the three; up to 1994 the port was a chain in the railway line London – Moscow. The Netherlands – UK water born connections will be subject to the same questions as the case studies presented above.

Individual project 5 PORTUGAL

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The Development of European Waterways, Road and Rail Infrastructures: A Geographical Information System for the History of European Integration (1825-2005)

The Portuguese team intends to use the advantage of an already existing platform (http://www.fcsh.unl.pt/atlas) and its experience in working with geographic information systems (GIS) and historical analyses[3], to comply, develop and achieve the main goals defined in the core project: to elaborate a GIS with historical information regarding the roads and railways network development in the past two centuries and to analyse the contribution of these material developments in the historical process of European integration.

Our main concern will be the digitalisation and GIS integration of the existing data on the evolution of Portuguese roads and railways network, between 1830 and 2000, with a ten-year gap. All the information gathered will be used in a historical analyses, not only, comparing the roads and railways network development in Portugal and Europe, focusing on an Iberian perspective, but also, studying the impact that this material improvements had in the Portuguese economy, demographic distribution and administrative evolution, over the past 150 years.

Methodologies/experiments

As mentioned, the Portuguese team will make use of a platform with the evolution of the administrative division of Portugal over the last two centuries, elaborated with GIS, Web-GIS and relational databases technologies. All the data was worked in intervals of about 10 years, following the publication of the population censuses that was produced with regularity since the 1860's. Although they have been published at the level of the parish, it is impracticable to collect, in the calendar defined for the project, the information for all the 4000 parishes in each one of the decades between 1860 and 2000. So, the demographic information will be collected at the municipal level corresponding to about 300 administrative units.

The statistical information of economic scope, nominated, on commerce, industry, importation and exportation, was published with some regularity in the last decades

[3] See the works of Silveira, Luís Espinha da and Alves, Daniel Ribeiro in the bibliography.

of 19th century. In 1935 the National Institute of Statistics (INE) was created, and it still constitutes, the main Portuguese organism in the production of official statistics. Some of the information produced by INE it's already digitalised and will be used as an advantage for the Portuguese project[4].

However, the roads and railway network will be the main data in our attention. In the National Library, in the National Archives Institute – Torre do Tombo, in the Archive of the Obras Públicas Ministry[5] and even in the archive of CP - Comboios de Portugal[6], the Portuguese railway company, it is possible to find an assorted set of statistical information and, in particular, cartographic one about the construction and exploration of the national roads and railways.

The study and the digitalisation of the cartographic sources, mainly regarding the different stages of the roads and railways construction, will be our main concern, with the purpose of historical and geographical reconstitution of the national network evolution, its connection to Spain and its integration in the European transportation systems. This work and the study of its development in the past 150 years will also be made on regular ten-year intervals.

The elaboration of the digital cartography and the data analysis will be made using common GIS tools, like spatial analyst and network analyst. In a first stage, it will be given a special attention to the structural and logical integrity of the relational database, which will allow congregating, verifying and analysing all the collected data. Only then, using its correspondent geographical location, all the information about population distribution and economic indicators will be cross with the pre-digitalised transportation network, which will include also some data about roads and railways traffic, namely passengers and merchandises movement.

The next step will be joining the Portuguese data with the one produced by the Spanish IP to accomplish a meaningfully analysis on common development standards not only concerning population and economy evolution on the two sides of the border, but also on historical tendencies of interconnection and relationship between both transportations networks. Could we talk isolated in the Portuguese or in the Spanish example, or it makes more sense to approach both countries European integration and the contribution given for that by the roads and railways network in an Iberian perspective? In this case, a cross border analysis should be even more interesting, for we could be study not two different regions, but just one with a common and very unique growth distinctiveness associated with interiority and with geographical and/or historical distance to the more developed urban centers that Lisbon and Madrid always was[7].

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[4] See http://www.ine.pt/.

[5] For this archive and about the sources for the study of roads in Portugal, see Andrade, Amélia Aguiar – *As estradas em Portugal: Memória e História*, Lisbon, Centro Rodoviário Português, 2002.

[6] See http://www.cp.pt/.

[7] For a look on the evolution of the railway networks in both countries see J. Marti–Henneberg and F. J. Tapiador – "The Uneven Regional Development of Europe (1850-2000)", presented at the 1st worshop of the Economic History Research Training Network, Warwick, UK, October 2005 and J. Marti–Henneberg, J. R. Modol and F. J. Tapiador – "The Rise of Railway Networks in Spain and Portugal, 1840-1940", presented at the Social Science History Association 2005 Annual Meeting, Portland, Oregon, EE.UU, November 2005. Regarding the study of cross border relations the Portuguese team recently collaborated in the elaboration of cartography for a demographic evolution analysis of the 20th century population in the Portuguese and Spanish border. See Moreira, Maria João da Silva Guardado – *A Dinâmica Demográfica na Região do INTERREG Ibérico no Final do Século XX*, Universidade Nova de Lisboa, 2001.

ASSOCIATE PROJECTS

Associated Project 1 UNITED KINGDOM

Dr. Ian Gregory (Lancaster University)
Prof. Robert Schwartz (Mount Holyoke College, USA)
Dr. Leigh Shaw-Taylor (University of Cambridge)

The European Road and Rail Infrastructure: A Geographical Information System for the History of European Integration (1825-2005)

There are two distinct components of the British contribution to this CRP. In the first, one British partner (Dr. Gregory) will contribute GIS and spatial analytical expertise to the overall European project focussing in particular on analysing how the Europe-wide growth of the transport network influenced, and was influenced by, broad demographic trends across Europe. The second, and larger component will be a project that makes use of GIS approaches to explore in detail how the growth of the transport network in England and Wales has influenced the demography and industrial structure of the country. This will be done collaboratively between Dr. Gregory who will provide much of the GIS expertise, Dr. Shaw-Taylor who will provide expertise in industrial structure, and Prof. Schwartz who will provide expertise in the demographic development. All three partners have a long-standing interest in the development of Britain's transport network.

Contribution to the pan-European project:

In previous work Dr Gregory, in collaboration with the Spanish partners Prof. Marti Henneberg and Dr. Tapiador, has taken a regional-level database of population data for Europe from 1870-2000 and standardised this on a single set of geographical units to allow the data to be analysed over time without the impact of boundary changes distorting the results (Gregory et al, forthcoming). Being able to remove the impact of boundary changes has been the focus of a significant amount of Dr. Gregory's research in recent years (Gregory, 2002; Gregory & Ell, 2005; Gregory & Ell, 2006). It is based on a set of techniques known as *areal interpolation*. The idea is to take data from a set of administrative units known as the source units, and estimate their values for a second set of administrative units known as the target units. For example, data for European regions for 1870 can be the source units and data from these can be interpolated onto modern regions, the target units, to allow direct comparisons with modern data. In this way long-term consistent time-series can be developed. Doing this requires complex GIS and spatial analytical functionality to both interpolate the data accurately and, critically, to identify places where the interpolation may not be providing accurate results. These techniques are now well developed and stable, and they have considerable potential to enhance our understanding of long-term spatio-temporal change using sources such as censuses and any other data published using administrative units.

In this work Dr. Gregory will re-interpolate Europe-wide population data to include data from countries not included in the initial analyses. In collaboration with the Spanish partners he will then integrate the rail and road GISs to provide the basis of an analysis of how population change and the growth of the transport network have interacted since the mid-nineteenth century.

We will perform an in-depth study of how the development of the transport network has influenced the development of England and Wales and its relationship with the rest of Europe. Britain provides an intriguing case study of how transport has affected

the integration of a country both within Britain, and between Britain and the rest of Europe. Britain was the first country to go through the industrial revolution and for many years led the world in the development of rail transport. More recently it has lagged behind in many ways both by allowing its rail network to decline and stagnate, and in being relatively slow to develop a network of major roads. It also has a unique relationship with Europe being an island on the edge of the continent with strong relationships to the Empire and the Commonwealth as well as countries such as the United States which have provided a focus for British trade and integration. These relationships have frequently conflicted with any desire for closer integration with Europe. Some historical analysis for Bob. In the general text I will talk about European integration and how this project could contribute to a better understanding

This project will benefit from the fact that a number of the key resources required are already available in digital form or are being created by other projects. These are:

- A database of the development of the rail network in England and Wales from 1825-1911. This is being developed by Prof. Schwartz and Dr. Gregory under a US National Science Foundation grant held by Prof. Schwartz. It builds on existing work by Dr. Peter Lewis, formerly of UCL but now retired.
- The Great Britain Historical GIS (GBHGIS). This holds the changing administrative boundaries of England and Wales from the mid-nineteenth century to the present linked to recurrent census, vital registration, and other routinely published demographic data (Gregory *et al*, 2002). Dr Gregory was the architect of this system.

We will extend these resources as follows:

- By extending the railway GIS to cover the period from 1911 to the present.
- By creating a GIS of the road network for England and Wales focussing on which motorways and trunk roads in existence for every decade. This will complement the European roads GIS but will be at the more detailed scale required for integration with data from the GBHGIS. This means that we need to take the data from maps of around 1:125,000 scale.
- By interpolating all relevant data from the GBHGIS onto a single set of administrative units to allow them to be compared over time. The bulk of this data is available at district-level, thus providing more spatial detail than the regional-level data available for the pan-European study.
- By calculating age and sex specific net migration rates for every district in England and Wales for the period from 1851 to the present. The methodology for doing this is described by Gregory (2000).

Once these data have been created and integrated we will be in a position to perform a major analysis of how the development of the transport infrastructure has developed in relation to demographic and industrial change from the mid-nineteenth century to the present. This will be based on major GIS resources that will allow us to unravel the spatial and temporal detail in these changes in a way that has not previously been possible.

Associated project 2 FRANCE

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The Role of the French state in the development of transportation infrastructure from 1830 to 2005

The French contribution will complement and enhance the European project in several ways.

1) *Cross--national comparison*: to move beyond the framework of a national study, an aim emphasized in the general proposal, we shall provide a comparative study of transportation policy and it's implementation, focused on the role of the French state in the development of railways from the 1830s to the present compared to the policy of the British state during the same period.
2) *Transnational connections* will be investigated through an analysis of international rail traffic across French borders. Particular attention will be given to historic patterns affected by the changing national status of Alsace-Lorraine after 1870 and 1919 and the high-speed TGV network.
3) *European integration* will be studied historically with particular attention to assessing the contribution of high-speed rail and super highways in transforming inter-national relations. This will entail defining pertinent indicators of transnational mobility, trade, and so forth that can serve to gauge the transforming effect of high-speed transportation.
4) *Urban and Rural.* To overcome the artificial distinction between urban-industrial and rural-agrarian sectors, we treat both sectors in our spatial and temporal analysis of railway expansion and its economic, social, and cultural effects.
5) *Rail transport and spatial inequalities.* On the eve of the transport revolution in France long-standing economic, social, and cultural disparities existed between what is generally described as the developed North/Northeast and the less-developed South. We shall identify historic patterns of regional growth, stagnation, decline and revitalization, and determine the extent to which historic disparities were reduced, maintained, or increased in relation to the expanding (and contracting) system of rail transportation. This will serve as important historical background for studying the role of the high-speed TGV network in the contemporary restructuring of spatial relations among regions and cities linked by TGV, and comparing contemporary results with patterns of change brought about by railways during the earlier periods examined. Economic historian J. C. Toutain has documented a convergence in the economic productivity of the North and the South during the nineteenth and twentieth centuries; we shall investigate the effect of rail transport in that convergence.
6) *Population change and migration.* We shall break new demographic and methodological ground by using surface-modeling techniques to construct a GIS database on demographic change at the level of the *commune*. Once completed, we shall then be able to study spatio-temporal patterns of population change and net migration at various geographic scales, ranging from the village—and through aggregation—to the canton, the department, region, and nation. The relationship of these patterns and rail transport will then be examined.

7) *Narratives of place.* To illustrate the varied effects of rail transportation in the realm of everyday life, narrative case studies of specific rural and urban communities will be developed.

This empirical research will be informed by theoretical work in spatial political economy and notably that of British human geographer Doreen Massey. Her *Spatial Division of Labour* (1995) and later work (2005) opened up narrow economic approaches, linking uneven economic development with spatial relations of power, political agency, and gender.

Based on a GIS Schwartz and Thevenin will construct with data on the expanding rail system and population change during the studied period. Then, Thevenin and Banos will develop the demographic component of the French GIS, and Schwartz will add to it data on agriculture, schooling, and newspaper circulation from the published studies of the Statistique Générale de la France. Once this work is completed, they will extend the GIS into the twentieth century. Using similar published sources and existing databases, Fachinetti-Mannone will add data on industrial development for the nineteenth and twentieth centuries and on the French rail network after 1930. Her analysis and narrative will concentrate on developments in the twentieth century and especially on the effects of the high speed rail service on territorial structuring at two geographic scales: 1) Europe and 2) France nationally and regionally. By viewing recent developments against long-term historical patterns she will be able to better assess continuity and change, and the significance of contemporary high speed transport to the process of European integration.

Methodology

A space-time database

The French research program will construct a GIS database for France in order to analyze the spatio-temporal relationship between rail transport and socio-economic development as indicated by the restructuring of agriculture and industry, population change, and migration. The principal challenge will be assembling spatially referenced data over the “longue durée” and then providing linkages with the other components of the European GIS . A major problem in studying long-term change in geographic space arises from on-going changes in the administrative boundaries, for they define the spatial units for which demographic and other data are recorded. To address this problem we shall apply an innovative method based on raster surface modeling to estimate communal population densities over the study period. The surface modeling for France can then be evaluated in relation to an alternative approach that Gregory will use for Britain, which requires building dynamic boundary files and areal interpolation. Much less costly in time and effort, the surface modeling of historical population change promises to be a pioneering innovation in historical social science.

Exploring Railway Expansion, Uneven Economic Development, and Demographic Change

Our spatial analysis will yield new understandings of the interaction between railway expansion, uneven economic development, and demographic change. We shall determine, for example, whether spatial variations in net migration (or population density) were associated with spatial variations in the availability of proximate rail service, including service of the classic kind and that of contemporary high-speed trains. Using Geographically Weighted Regression [GWR] (Schwartz and Gregory, forthcoming), we shall identify multivariate relationships over space and time, exploring, for instance, the spatially varying relationship between population change due to net migration and the interactive effect of rail accessibility, distance from a major urban center, and the ruggedness of the terrain. The same approach will be

used to identify varying and shifting patterns of spatial economic inequalities as indicated by both agrarian and industrial developments. Unlike traditional, “global” statistics that seek to find an “average” pattern that reveals a “general law,” our study employs “local” spatial statistics designed specifically to identify patterns of difference, variation, and anomaly within a study area.

Finally, our spatial analysis will be completed by geo-visualization techniques. Animated maps will clarify the evolution of population densities and economic development over the time within France. Tested in previous work (Thevenin, 2001 ; Banos and Thevenin, 2005 ; Banos et al. 2005), this dynamic mapping will be greatly facilitate the understanding of the relationship between transportation and geographic change over time.

Associated project 3 BULGARIA

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ROADS CONNECTING, ROADS DIVIDING: Infrastructure in South East Europe

Although an integral part of the continent, South East Europe represents a very special case of infrastructure as a factor of linking or de-linking to/from Europe. Historically, infrastructure in this European periphery has meant much more than mere roads, rails, pipelines or bridges. Infrastructure has been the material expression of the region’s striving for Europe; it has meant channels of communications, modernity, culture, ideas, fashions, etc. Even today when people from the Balkans take the train to go to Vienna or Paris, they say “*I take the train to Europe*”. Paradoxically at first glance, this paramount importance has not helped but strongly impeded the actual construction of infrastructure.

Aims and objectives

European infrastructure has been created in the course of centuries along the vectors of long lasting links between the commercial, industrial or cultural urban centers of the continent. The history of road building in South East Europe has been subjected to a different logic. First it was the logic the empires - the Roman, Byzantine or Ottoman. Then came the modern period of political cartography, when the small area of the peninsula was divided among a great number of national states, most of the time hostile and isolated from each other, but always eager to reach the developed part of the continent

Methodology

The approach is pronouncedly interdisciplinary, combining the tools of economic history, political history and international relations. The idea is to conceptualize the reasons why the three concentric circles of Balkan infrastructure - regional, national and all -European have most often been in contradiction.

This part of the project (AP) will take advantage of the GIS and data collected by the participants in the main project, check their basic findings against the complicated interplay of national, regional, and continental factors in one specific and important part of Europe. The case study of South East Europe will enrich the narrative on the development of European infrastructure and demonstrate that this development has not always been one-directional and one-dimensional. Thus the project in general

might go beyond the technicalities of data collection and mapping and rise to the name of truly pan-European.

The two members of the group will divide their work in several aspects/periods:

1. Location/Geography, Periphery/Crossroads

Situated at the end of Europe, a gateway to three continents, with shores washes by six seas and the second longest European river the Danube, the Balkans represent simultaneously a periphery of Europe and one of the world's greatest crossroads.

2. History (Romans, Byzantines, Ottomans)

As elsewhere in Europe the Romans were the first road/system builders: from 3rdC. B.C. to the end of first century A.C. the Balkans became part of the ancient system of highways linking Rome with its most distant provinces and serving the Empire's military-political functions. After the fall of Rome, the Byzantines and the Ottomans had neither the vision, nor the resources to maintain the old Roman road system. Generally speaking, ever since the Romans, the road network in the region had been continuously deteriorating. As numerous travelers testified, by mid-19th C. the road system had completely collapsed. In fact, it was only in the second half of the 20th C. that the road system of South East Europe reached the level and the importance of the Roman system.

3. Modern history (Nation States/ Balkanization)

Whatever the rule was - Greek, Roman, Ottoman - the Balkans represented a geographical and political entity. This came to an end in the modern era, when one after the other the Balkan nations carved their national states from the territories of the Ottoman and the Austro-Hungarian Empires and created a unique mosaique of states and statelets. The process began in the early 19th C. and it is still going on. The mountainous peninsula became the epitome of fragmentation, division, and confrontation, the birthplace after all of the very term 'Balkanization". A nightmarish series of wars, reshuffling of territories and population, petty rivalries and strong hostilities have characterized the two-century history of the modern Balkans.

4. Belated modernization

According to some economic historians industrialization did not occur until 1914, according to others – not until the 1950s. So the construction of a modern transportation system in the Balkans was to a great extent a function of their backwardness. Railroad construction started late and reflected the struggles among the Great Powers first, to control better the 'sick man of Europe' and later, to dominate over the newly liberated states. The question of the direction of railways was entirely political; foreign investors naturally directed them according to their own interests..

Unlike Western Europe where rise of infrastructure preceded or coincided with the Industrial revolution and was a substantial factor for its advance, in the Balkans railways never became a prime mover of economic growth; there was no mutually reinforcing effect of transport and industry, or something like the Schumpeterian *railroadization.*

5. A snapshot of the current state of affairs

As a result of a deadly combination of economic and political factors, infrastructure in the Balkans is hopelessly insufficient and outdated. There is a huge discrepancy between European and global trends to massive movement of people and goods and

the region's stagnation and lack of local network, contemporary roads, or high speed trains.

The most stubborn infrastructural difficulty facing all Balkan states remains the mismatching of theirs national transport systems. Still captured in the yesterday's mentality and total lack of the culture of cooperation, the countries are trying to outsmart each other and pull international traffic or investment to themselves. Curiously, the 19th C. rivalries about the railways are being replicated in the rivalries about present day's pipelines, or pan European routes.

6. Enlarging Europe reaches the Balkans

The Balkans of nowadays are on the threshold of a new era. The prospect of EU membership puts an end to the hostilities and scuffle of the small states, a real breakthrough is in the making. The EU is extending the trans-European networks for energy, transport and telecommunications to the East and South East of Europe. The Balkan countries are learning how coordinate national priorities and to cooperate within enlarging European network.

Infrastructure is believed to play for South East Europe the role played by coal and steel for Western Europe..

7. Case Studies:

The list of specific, highly illustrative cases is endless: the Sofia-Skopje railway, which has been in construction for a century and never finished; the Brotherhood and Unity Highway – a symbol of the unity of the Yugoslav people, which turned into a symbol of separation and destruction; the new "para" Egnatia, pulled to South in order to connect two Greek ports; Lower Danube's bridges and canals - judged by the standards of Central and Western Europe, the river has had a surprisingly small impact on the region's communications.

Associated project 4 GERMANY

Dr. Andreas Kunz (Institute of European History, Mainz, Germany)

Transport Networks in Germany and Central Europe, 1825-20

There are three areas of activity in which the German associated partner will contribute to the proposed CRP:

1. Statistical mapping, using digital maps of Europe already existing on a mapserver based at the Mainz Institute. This has been explained already above under "Tasks Breakdown" in Section A as well as within the Dutch proposal and need not be restated here.
2. Data sharing. The national GIS "HGIS Germany", which is currently being built up at the Mainz Institute in conjunction with the University of Applied Sciences in Mainz, contains digital resources and statistical data that can be shared with the CRC project partners. In particular, the growth of the German rail network between 1835 and 1885 has already been researched and has been implemented in this system. Likewise, data on the development of the waterway network and on the road system has been collected and been partially placed within the GIS. Data on population and on leading economic sectors (mining, iron and steel, textiles) can be made available as well.
3. The creation of a parallel project. Provided that funding can be ascertained through national funding agencies, it is proposed that the transport-related GIS

sections of HGIS Germany will be developed further, specifically extended beyond 1885 into the 20th century. Transport-related information will be linked to the segments ("arcs") contained in the GIS' database, so that a fullfledged information system on German transport can be made available. It will be placed online, but also serve as the core for an analytical narrative by Dr. Kunz on the economic and spatial development of German transport in the 19th and 20th centuries.
Numbers 1 and 2 can be seen as direct contributions to the pan-European project, number 3 is a German project for which national funding outside the "Inventing Europe Scheme" will be sought.

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